4.3.5.3 Partially Completed Light Water Reactor Alternative

The environmental impacts described in the following sections are based on the analysis of the partially completed LWR facility for the Partially Completed LWR Alternative described in Section 2.4.5.3. This alternative would require the operation of a minimum of two LWRs, which could be located at the same or different sites. Environmental impacts for this facility are described in the context of a generic range of conditions that could exist at potential locations.

In accordance with this alternative for surplus Pu disposition, two partially completed LWRs would be needed. The two LWRs could be at one site, or the reactors could be at two sites. If there are two reactors at one site, the impacts in Sections 4.3.5.3.1 through 4.3.5.3.10 would be approximately doubled unless otherwise indicated (for example, direct workers).

4.3.5.3.1 *Land Resources*

Land Use. Because this is an existing site, direct impacts to land use are not anticipated during completion of construction and during operation. Existing land use would not change; additional land area would not be disturbed for the facility nor required for a buffer zone. Since the reactor facility is partially completed, land use should be in conformance with site development/facility plans for the representative site. Additionally, development should be in conformance with land-use plans, policies, and controls at the Federal, State, and local levels. As discussed in Section 4.3.5.3.8, nonhousing units in excess of existing vacancies would be required to accommodate in-migration that would occur during both the construction and operational phases. No offsite land use would be affected during construction; therefore, indirect impacts would not occur.

Visual Resources. No impacts to visual resources would be caused by completion of the facility. The existing VRM classification would reflect that of a developed industrial facility (Class 5). It is unlikely that visual impacts would be caused by completion of construction. Facility operations could cause an increase in visual impacts to adjacent lands. An increase in visible stack plumes could impact viewpoints with high sensitivity levels including water-based recreational use urbanized areas, residential areas, and public roadways within the viewshed depending on distance, atmospheric conditions, and level of screening provided by vegetation and terrain.

[Text deleted.]

4.3.5.3.2 *Site Infrastructure*

The site infrastructure of the partially completed LWR would conform to the conditions described in Section 3.12.2. A site infrastructure at the partially completed site is already in place to support completion of the construction project. This includes roads, parking and facilities to accommodate approximately 4,500 site employees. The infrastructure would require only minor upgrades to accommodate the workforce needed to complete the project (see Table 4.3.5.3.2–1). The reactors would be completed essentially as if they were to be fueled with LEU fuel. The change to MOX fuel would have minimal impact on the partially completed LWR and would not affect the site infrastructure. The site is served with water and an existing power distribution system that would adequately support the power demands of plant equipment and employee facilities.

Table 4.3.5.3.2–1. Additional Site Infrastructure Needed for the Operation of the Partially Completed Light Water Reactor (Annual)

	Transportation		Electrical		Fuel		
	Roads (km)	Railroads (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Facility Requirement	<8	<6	700,000 to 1,100,000	96 to 140	Approximately 757,000	0	0
Range of resource availability	<8	<6	700,000 to 1,100,000	96 to 140	Approximately 757,000	0	0
Amount required in excess of low-end range of available resources	0	0	0	0	0	0	0

Source: LLNL 1996g; TVA 1995b:1.

4.3.5.3.3 *Air Quality and Noise*

Construction and operation of the partially completed LWR facility would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts, criteria and toxic/hazardous concentrations from this facility have been compared with Federal standards. Impacts for radiological airborne emissions are discussed in Section 4.3.5.3.9.

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts are described separately. Supporting data for the air quality and noise analysis are presented in Appendix F.

AIR QUALITY

Remaining construction and operation of the facility would result in the emission of some pollutants at the representative sites. Emissions would typically not exceed Federal, State, or local air quality regulations or guidelines.

The principal sources of emissions during completion of construction include the following:

- Fugitive dust from wind erosion of exposed ground surfaces
- Exhaust from and road dust raised by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

Appropriate control measures would be followed. It is expected that the site will continue to comply with applicable Federal and State ambient air quality standards during construction.

Emission rates for operation of partially completed LWR are presented in Table F.1.3–13. Air pollutant emissions sources associated with operations include the following:

- Operation of auxiliary steam generators
- Operation of diesel generators and periodic testing of emergency diesel generators
- [Text deleted.]
- Small quantities of toxic/hazardous pollutant emissions from various facility maintenance activities

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal regulations. The estimated pollutant concentrations for operation of this facility are presented in Table 4.3.5.3.3–1.

NOISE

The location of the facilities associated with the partially completed LWR facility relative to the site boundary and sensitive receptors was examined for a partially completed reactor site. The potential contribution to noise levels at the site boundary was evaluated.

Noise sources during completion of construction may include heavy-construction equipment and increased traffic. Increased traffic would occur onsite and along major offsite transportation routes used to bring construction material and workers to the site. Noise impacts associated with increased traffic on access routes were not evaluated.

Table 4.3.5.3.3–1. Estimated Incremental Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Partially Completed Reactor

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m³)	Representative Site[b] (μg/m³)
Criteria Pollutants			
Carbon monoxide	8-hour	10,000	<0.01
	1-hour	40,000	<0.01
Lead	Calendar Quarter	1.5	[c]
Nitrogen dioxide	Annual	100	0.05
Ozone	1-hour	235	[d]
Particulate matter less than or equal to 10 microns in diameter	Annual	50	<0.01
	24-hour	150	0.015
Sulfur dioxide	Annual	80	0.04
	24-hour	365	0.15
	3-hour	1,300	0.35
Hazardous and Other Toxic Compounds[e]			
[Text deleted.]			

[a] The Federal standards are presented.
[b] The concentration represents the alternative contribution only. No Action concentrations at a generic site cannot be determined since there is a range of possible pollutants and conditions that could be found at a potential site.
[c] No sources of this pollutant have been identified.
[d] Ozone, as a criteria pollutant, is not directly emitted or monitored by the sites. See Section 4.1.3 for a discussion of ozone-related issues.
[e] Emissions of unspecified hydrocarbons were not modeled.
Note: Concentrations are based on site contribution and do not include the contribution from nonfacility sources.
Source: 40 CFR 50; TVA 1974b.

Nontraffic noise sources associated with operation of this facility include ventilation systems, cooling systems, circuit breakers, pumps, motors, vents, diesel generators, transformers, paging systems, and material handling equipment. These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would be small (TVA 1974b:2.6-14,8.2-13). Due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts, such as disturbance of wildlife.

4.3.5.3.4 *Water Resources*

Utilizing excess Pu as fuel would have impacts from completion of construction and the operation of a partially completed LWR. Water resources requirements, provided in Table C.1.1.3–7, were used to assess impacts to surface water. The water requirements to complete the construction of both units would be 440 million l/yr (116 million gal/yr). The average water requirement for construction of a single partially completed LWR would be 220 million l/yr (58.1 million gal/yr). Impacts to the river flow would be negligible. [Text deleted.]

During operations, approximately 138,167 million l/yr (36,500 million gal/yr) of water would be required for the operation of both reactors (TVA 1974b:2.9-11). The average water withdrawal from the operation of a single partially completed LWR would be 69,084 million l/yr (18,250 million gal/yr) which is 0.2 percent of the average flow of the river (89 billion l/day [23.5 billion gal/day]). This withdrawal is not anticipated to have any impacts on downstream users. This amount would not curtail known or projected industrial water uses or affect the average flow by the site each day. Operational impacts have been identified in the site-specific EIS that has been prepared for these facilities.

During operations, sanitary wastewater would be discharged at the site. However, at a wet site, unlike water waste effluent from treatment facilities which is released on a continuous basis, cooling system blowdown activities would also occur. The normal blowdown rate from the cooling towers from both reactors would be approximately 2.09 m^3/s (74 ft^3/s) during periods of high evaporation (TVA 1974b:2.5-1). The average blowdown from the operation of a single partially completed LWR would be 1.05 m^3/s (37 ft^3/s) which is 0.1 percent of the average flow of the river (1,029 m^3/s [36,359 ft^3/s]). This blowdown is not anticipated to have any impacts on downstream users. Blowdown will be returned to the river through a diffuser system designed to provide good diffusion and to minimize environmental impacts due to the disturbance of aquatic life during construction and operation of the reactor (TVA 1974b:2.5-1).

Impacts to floodplains from the partially completed LWR (for both construction and operation) were not elevated in the site-specific EIS for the partially completed LWR because although the Bellefont site was used for analyses purposes, specific sites for floodplain analysis are not proposed at this time. If this alternative is selected for further consideration as a method of disposition, site-specific floodplain evaluations would be conducted in future tiered NEPA documents, as appropriate.

4.3.5.3.5 *Geology and Soils*

Effects to the geologic and soil resource as a result of construction and operational activities at a partially completed LWR for the final disposition of Pu are assessed for the representative site.

No direct or indirect effects from restricted access to potential geologic resources as a result of facility or site infrastructure improvements are anticipated because the site is partially completed and no new ground-disturbing construction is anticipated.

Implementation of this alternative would not involve ground-disturbing construction activities that will affect the soil erosion potential. Operational impacts to the soil resource would be minimal assuming typical landscaping and ground cover improvements were employed. Areas previously without ground cover would have some type of improvements (buildings, roads and landscapes). Soil erosion from stormwater runoff and wind action could occasionally occur during operation but are anticipated to be minimal.

4.3.5.3.6 *Biological Resources*

Terrestrial Resources. The assumed representative partially completed reactor site that could be utilized for the disposition of surplus Pu is located within the deciduous forest principal vegetation type. Although numerous construction activities would be required to complete the plant, such activities would generally take place on previously disturbed land. Construction could cause some disturbance to wildlife living immediately adjacent to the facility. During operation of the completed reactor, noise and human presence could continue to discourage some species from living nearby. Depending upon the type of cooling system used, operational impacts to vegetation are possible from salt drift.

Wetlands. Direct impacts to wetlands are unlikely since construction activities would generally take place on previously disturbed land. Indirect impacts from erosion and subsequent sedimentation could occur. However, implementation of a soil erosion and sedimentation control plan would limit such impacts. During operation, wastewater discharges could impact wetlands in the immediate vicinity of the outfall. Also depending upon the type of cooling system used, salt drift from cooling towers could impact wetland areas.

Aquatic Resources. Impacts from construction activities to aquatic species could result from sedimentation of nearby waterbodies. Effective erosion control would prevent damage to aquatic resources.

Operation of the LWR could lead to an increase in the impingement and entrainment of aquatic organisms. The extent to which this would impact local fish populations would be dependent upon the stream size, intake and discharge volumes, intake and discharge structure design, and the susceptibility of individual species to impingement and entrainment. Thermal impacts resulting from the discharge of cooling tower blowdown are possible. Thermal impacts would be controlled by the conditions of an NPDES permit.

Threatened and Endangered Species. Construction activities associated with completion of a reactor are unlikely to impact threatened and endangered species. This is the case since little or no additional habitat would be disturbed. Operational impacts, such as from operation of the cooling system, are possible but depend on the specific species present. Preactivity surveys and consultation with the USFWS and the appropriate State agency would be completed as necessary prior to construction or operation of the reactor.

4.3.5.3.7 *Cultural and Paleontological Resources*

This section discusses impacts to cultural and paleontological resources that may result from the construction and operation of a partially completed LWR. For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Prehistoric resources that may occur in the vicinity of the partially completed LWR include remains of villages, cemeteries, and hunting and butchering sites. Historic sites may include cemeteries, remains of residential or commercial structures, or road traces. It is possible but unlikely that resources may be affected by the completion of the facility. Operation would not cause additional effects. Some Native American resources such as archaeological sites or traditional use areas may also occur in the areas.

No paleontological resources have been identified in the vicinity of the partially completed LWR. Cultural and paleontological resources may be affected directly through ground disturbance during construction, building modification, visual intrusion of the project into the historic setting or environmental context of historic sites, visual and audio intrusions into Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism. Minor modifications to existing facilities would be necessary under this alternative. Some infrastructure improvements may also be necessary. Specific concerns about the presence, type, and location of Native American resources would be addressed through consultation with the potentially affected Native American tribes.

4.3.5.3.8 *Socioeconomics*

Regional Economy Characteristics. Finishing the construction of the partially completed reactor would generate employment and income increases within the affected region. Facility construction would create 2,848 total jobs (1,525 direct and 1,323 indirect) for one reactor and 4,305 (2,305 direct and 2,000 indirect) for two. However, total employment and per capita income in the representative site's REA would increase by less than 1 percent under either scenario. Operation of one reactor would generate about 2,200 total jobs in the REA (847 direct and 1353 indirect) and 3,311 total jobs (1,275 direct and 2,036 indirect) would be created with the operation of two reactors. Operation of one or two reactors would increase employment in the REA by less than 1 percent over No Action projections. The unemployment rate would decrease slightly and there would be small increases in per capita income (Socio 1996a). Only the Two-Reactor Option is analyzed for population, housing, and community service because it would have a greater impact on the region.

Population and Housing. The resident labor force would not be sufficient to fill all of the newly created jobs during the construction and operation phases of the project. In-migrating workers and their families would increase population in the ROI during both phases of the project. About 180 construction-related workers would in-migrate, and population would increase by much less than 1 percent over to No Action population projections. During operation of the facility, approximately 300 workers would in-migrate to the ROI. Population growth would be less than 1 percent over No Action projections. No housing units, in excess of existing vacancies, would be required in the ROI during construction and operation of the project (Socio 1996a).

Community Services. Constructing and operating the partially completed LWR would slightly increase the demand for community services at the representative site.

School enrollments would increase in the representative ROI during construction and operation of the facility. To maintain the No Action student-to-teacher ratio of 15.5:1, two new teachers would be needed during peak construction of the two-reactor facility, and eight additional teachers would be needed during operation. The increase in teacher requirements would be distributed over several school districts in the ROI; therefore, no single school district would be significantly affected (Socio 1996a).

Only 1 additional police officer would be needed during both the construction and operation phases of the two-reactor facility to maintain the No Action service level of 1.5 officers per 1,000 persons in the representative site's ROI. One new firefighter would be needed during construction, and only 3 new firefighters would be needed during operation to maintain the current service level of 4.1 firefighters per 1,000 persons (Socio 1996a).

Projected hospital occupancy rates during peak construction and full operation would increase slightly over No Action levels, with existing hospital capacities capable of accommodating the small increase in patient load. No additional physicians would be needed during construction, and only one new physician will be needed during operation of the two-reactor facility (Socio 1996a).

Local Transportation. The two-reactor option's construction and operation may cause a decline in the level of service on some roads around the representative site. Some road improvements may be required (Socio 1996a).

4.3.5.3.9 *Public and Occupational Health and Safety*

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal performance or accidents involved with the operation of an LWR that is presently only partially completed. The section first describes the impacts from normal facility operation followed by a description of impacts from reactor accidents. The impacts associated with the ultimate disposal of the spent fuel in a high level waste repository are presented separately in technical documents that specifically address repository operations.

Summaries of the radiological impacts to the public and to workers associated with normal operation during the assumed 17-year campaign time are presented in Tables 4.3.5.3.9–1 and 4.3.5.3.9–2, respectively. Detailed results are presented in Appendix M.

Normal Operation. There would be no radiological releases associated with the construction needed to complete the reactor. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained as low as reasonably achievable. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as the result of construction activities. However, concentrations would be within the regulated exposure limits.

During normal reactor operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers are described below.

Radiological Impacts. Radiological impacts to the average and maximally exposed members of the public resulting from the normal operation of the reactor and its support facilities are presented in Table 4.3.5.3.9–1. Since there are no other nuclear activities at the site, the impacts from total site operations would be the same as the reactor facility impacts. The doses to the maximally exposed member of the public from annual operations are within the radiological limits specified in Appendix I to 10 CFR 50 and 40 CFR 190 (if the reactor is licensed by NRC). The dose would be 0.57 mrem from all pathways. From 17 years of operation, the associated risk of fatal cancer to this individual would be 4.9×10^{-6}. The impacts to the average individual would be less. this activity would be included in a program to ensure that doses to the public are ALARA. As a result of annual total site operation, the population dose would be 0.61 person-rem and the number of fatal cancers in the population from 17 years of operation would be 5.2×10^{-3}. To put the operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

Doses to onsite workers from normal operations are given in Table 4.3.5.3.9–2. The annual average dose to the site worker would be 360 mrem. The dose to the entire workforce would be 380 person-rem. The risk and number of fatal cancers among the workers from 17 years of operation are included in Table 4.3.5.3.9–2.

Hazardous Chemical Impacts. There would be no increase in the potential hazardous impact to the public and workers from construction of the partially completed LWRs. The potential impacts of chemical emissions from operation would be as stated in the Bellefonte Final EIS dated May 1974. The source of chemicals and chemical quantities were reviewed and updated in connection with the renewal of the NPDES permit in 1992 (TVA 1993a:7). The computations and assumptions used for this review were consistent with those in this PEIS and potential impacts are still expected to be insignificant. This is confirmed by voluntary toxicant testing which is conducted on a semiannual basis. The *Letter Report FMDP LWR PEIS Data Report* (ORNL/MD/LTR-9, February 28, 1995) indicates that if a change were made from burning uranium-based fuel to burning MOX fuel in an LWR, the nonradiological chemical emissions would not change. Therefore the potential health impacts to the public and workers from hazardous chemicals emitted from the partially completed LWRs alternative facility would not change from the LWRs using UO_2 fuels.

Table 4.3.5.3.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Partially Completed Light Water Reactor

Receptor	Generic Site	
	Reactor	**Total Site[a]**
Annual Dose to the Maximally Exposed Individual Member of the Public[b]		
Atmospheric release pathway (mrem)	0.56	0.56
Drinking water pathway (mrem)	1.4×10^{-3}	1.4×10^{-3}
Total liquid release pathway (mrem)	5.4×10^{-3}	5.4×10^{-3}
Atmospheric and liquid release pathways combined (mrem)	0.57	0.57
Percent of natural background[c]	0.19	0.19
17-year fatal cancer risk	4.9×10^{-6}	4.9×10^{-6}
Annual Population Dose Within 80 Kilometers		
Atmospheric release pathway (person-rem)	0.47	0.47
Total liquid release pathway (person-rem)	0.14	0.14
Atmospheric and liquid release pathways combined (person-rem)	0.61	0.61
Percent of natural background[c]	1.6×10^{-4}	1.6×10^{-4}
17-year fatal cancer risk	5.2×10^{-3}	5.2×10^{-3}
Annual Dose to the Average Individual Within 80 Kilometers[d]		
Atmospheric and liquid release pathways combined (mrem)	4.5×10^{-4}	4.5×10^{-4}
17-year fatal cancer risk	3.8×10^{-9}	3.8×10^{-9}

[a] Since there are no other nuclear activities at the site, the total site impacts are the same as the incremental impacts.

[b] The standards for individual members of the public are given in Appendix I to 10 CFR 50 and 40 CFR 190 for NRC licensed reactors. As discussed in Appendix I, 5 mrem/yr is the airborne emission guideline and 3 mrem/yr per reactor is the liquid release guideline. Meeting these guideline values serves as a numerical demonstration that doses are ALARA. A total dose of 25 mrem/yr is the limit from all pathways combined, as given in 40 CFR 190. If the reactor is owned by DOE, the applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA, 4 mrem per year from the drinking water pathway as required by the SDWA, and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[c] Annual natural background radiation levels: the average individual receives 298 mrem; the population within 80 km receives 407,000 person-rem.

[Text deleted.]

[d] Obtained by dividing the population dose by the number of people projected to be living within 80 km of the site (1,365,000).

Source: Section M.2.

Table 4.3.5.3.9–2. Potential Radiological Impacts to Workers During Normal Operation of the Partially Completed Light Water Reactor

Receptor	Generic Site
Involved workforce[a]	
Average worker dose (mrem/yr)[b]	360
17-year risk of fatal cancer	2.4×10^{-3}
Total dose (person-rem/yr)	380
17-year fatal cancers	2.6

[a] An involved worker is a worker associated with operations of the proposed action.

[b] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 20).

[Text deleted.]

Source: NRC 1995b; ORNL 1995b.

Facility Accidents. For the partially completed commercial LWR, a Preliminary Safety Analysis Report (PSAR) has been prepared for the representative reactor in accordance with NRC Requirements. The PSAR does not reflect the potential effects on public and worker safety of using MOX fuel. An analysis, described in Section M.5, has been performed which indicates that the use of MOX fuel in a commercial LWR would have small effects. This can be seen from the information provided in Tables 4.3.5.2.9–3 and 4.3.5.2.9–4. For each of the three reactor cases of severe accidents listed, the MACCS code was run for the severe accidents identified based on a uranium-fueled core and a MOX-fueled core. Although the sets of severe accidents are not specifically for the partially completed reactors applicable to this alternative, the results of the MACCS code analysis are considered relevant. Each entry in the table is the ratio of impacts of severe accidents for a MOX-fueled reactor and a uranium-fueled reactor. The results indicate that the use of MOX fuel in place of uranium fuel in a LWR would have an effect on accident impacts ranging from an 8-percent decrease to an 8-percent increase depending on the accident that occurs.

4.3.5.3.10 *Waste Management*

This section summarizes the waste management impacts for the construction and operation resulting from the burning of MOX fuel in a partially completed commercial LWR. There is no high-level or TRU waste associated with the burning of MOX fuel in a LWR. Table 4.3.5.3.10–1 provides the total estimated operational waste volumes projected to be generated per reactor for burning MOX fuel in a partially completed commercial LWR. Waste generation volumes under No Action are from maintenance activities and the limited engineering design work. Facilities that would support the partially completed commercial LWR would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with NRC regulations, RCRA, and other applicable statutes as outlined in Section E.1.2.

Construction and operation of the partially completed commercial LWR would impact existing waste management activities at the site, by initiating the generation of spent nuclear fuel, LLW, and mixed LLW, and increasing the generation of hazardous and nonhazardous wastes. Wastes generated during construction would consist of wastewater and hazardous, low-level, and nonhazardous solid wastes. A small amount of solid LLW, 0.5 m^3 (0.7 yd^3) composed mainly of radioactive sources, would be generated during construction. Inert construction and demolition wastes ranging from 211 m^3 (276 yd^3) to 392 m^3 (513 yd^3) for concrete; 88 t (97 tons) to 208 t (229 tons) for steel; and 21,000 m^3 (27,500 yd^3) to 49,000 m^3 (64,100 yd^3) for block, brick, gravel, asphalt, gypsum board, and other materials, would be placed in dumpsters for disposal by the solid waste disposal contractor at an offsite permitted landfill or recycled if appropriate. Construction sanitary wastewater from the main plant (based on data from similar plants) range from 127,000 m^3 (33,500,000 gal) to 274,600 m^3 (72,500,000 gal) and would be routed to the local municipal sewage treatment system. Typical hazardous waste generated during construction of a partially completed reactor site (based on data from a similar plant) include paints, solvents, acids, oils, radiographic wastes and degreasers, and range from 3.4 t (3.7 tons) to 6.3 t (6.9 tons) for solid hazardous wastes and 30.6 m^3 (8,080 gal) to 56.7 m^3 (15,000 gal) for liquid hazardous wastes. The only waste treatment performed for construction waste onsite would be neutralization of acids. Hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities (TVA 1995b:1).

Operation of the partially completed commercial LWR would generate spent nuclear fuel. The MOX fuels designed for serving Pu disposition would not stay in the reactors' cores for recovering their full economic values. For this analysis it was assumed that the MOX fuel bundles would be removed as soon as the fuel has been irradiated to the point where it had met the Spent Fuel Standard. Therefore the MOX fuel cycle for each refueling would be shorter than the original design. This assumption was used in order to bound the impacts for spent fuel generation and storage plus it would dispose of the excess weapons-usable fissile material as quickly as possible. Spent nuclear fuel would have to be stored onsite until a Federal geologic repository is available. Data from existing PWR commercial reactors of the same size show that the number of assemblies discharged annually could range from 50.7 to 108.5 (an average of 80 assemblies). Assuming 0.43 t (0.47 tons) per fuel assembly, the residual heavy metal content would range from 22 to 47 t (24 to 52 tons). The original onsite design capacity/availability of pool storage, or above-ground dry storage could be challenged due to the shorter fuel cycle.

Liquid LLW would be treated in an onsite radwaste treatment facility. Compactible solid LLW would either be taken offsite or remain onsite for volume reduction, prior to disposal. For disposal, all LLW would be transported in a solid form. Based on data from 8 existing PWR plants, a range of from 57 m^3 (75 yd^3) to 637 m^3 (833 yd^3) of LLW would be shipped offsite for disposal, as frequently as from 6 to 31 times each year. Assuming the LLW would be transported to a site within the DOE complex for disposal, land usage factors may vary from 3,300 m^3/ha (1,700 yd^3/acre) to 8,600 m^3/ha (4,500 yd^3/acre). Consequently, this would require a range of 0.01 ha/yr (0.03 acres/yr) to 0.07 ha/yr (0.2 acres/yr) of LLW disposal area. If the LLW is taken to a NRC or State disposal site, transportation impacts and land usage LLW disposal factors would vary according to the disposal site.

Table 4.3.5.3.10–1. Estimated Annual Waste Volumes Generated Per Reactor for Mixed Oxide Fuel in Partially Completed Light Water Reactors

Category	With MOX Fuel (m^3)	No Action (m^3)
Spent Nuclear Fuel	50.7 to 108.5[a] assemblies	None
Low-Level		
Liquid	18,930[b]	None
Solid	57 - 637	None
Mixed Low-Level		
Liquid	0	None
Solid	102	None
Hazardous		
Liquid	Included in solid	Included in solid
Solid	27	2
Nonhazardous (Sanitary)		
Liquid	341,000	3,780[c]
Solid	5,280	51[d]
Nonhazardous (Other)		
Liquid	Included in sanitary	None
Solid	4,430[e]	1.8-3.6[f]

[a] Residual heavy metal content of 22 to 47 t, assuming 0.43 t per assembly for PWR.
[b] Liquid LLW would be treated and solidified prior to disposal.
[c] Estimate based on 80 employees, 189 l/day/employee and 250 days per year of operations.
[d] Estimate based on 80 employees, 0.0085 m^3/day/employee and 250 days per year of operations.
[e] Recyclable wastes.
[f] One to two tons of desiccants. Estimate based on density at 500 kg/m^3.
Source: DOE 1995f; ORNL 1995b; TVA 1995b:2.

Approximately 102 m^3 (133 yd^3) of mixed LLW, consisting primarily of decontamination wastes and ion exchange resins, would be stored onsite until treatment and disposal is available at an offsite RCRA-permitted facility, or shipped to another facility in the DOE complex for treatment and disposal; in accordance with their site treatment plan that was developed pursuant to the requirements of the *Federal Facility Compliance Act*. Hazardous and nonhazardous waste would be managed in accordance with site practice.